

AIR FORCE MATERIEL COMMAND
**LEADING
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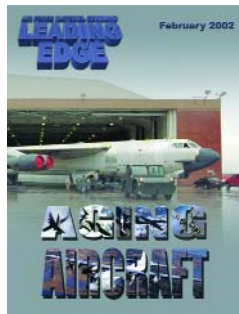
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4 - 13 Aging weapon systems

The Air Force Materiel Command increasingly faces challenges of supporting aging aircraft with innovative technologies and programs created to extend their life. Turn the page to see the many ways AFMC is improving the fleet's sustainability.

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He doesn't leap tall buildings in a single bound, but he is motivated by a perpetual adrenaline rush. Turn to page 20 to read how this mild-mannered lieutenant can't be judged by his demeanor.



A maintenance crew assists Lt. Col. Larry Blades (front seat) and Navy Cmdr. John Garbelotti after Air Force Operational Test and Evaluation Center pilots landed the first production T-6A Texan II at Randolph AFB, Texas, last March. The Air Force approved full rate production of the system in December. (Air Force photo)

Air Force approves full rate production of JPATS

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Air Force officials recently approved full-rate production of the Joint Primary Aircraft Training System, authorizing the service to procure additional T-6A Texan II aircraft and related systems.

Ms. Darlene Druyun, Air Force principal deputy assistant secretary for acquisition and management, signed an Acquisition Decision Memorandum, authorizing the purchase in addition to the 168 aircraft already ordered from prime contractor Raytheon Aircraft Co. from Wichita, Kan. The action also permits the follow-on contract, valued at \$1.4 billion including options, to be awarded at a later date.

"The T-6A Texan II aircraft is the safest, most cost-effective, joint primary pilot training tool available in the free world today," said Col. Toni Arnold, Aeronautical Systems Center Flight Training System Program Office director here.

Air Force and Navy experts have already delivered 49 JPATS aircraft to Randolph AFB, Texas, where they're used to train pilot instructors. AETC student pilots started training with JPATS Oct. 10 at Moody AFB, Ga.

A current Air Force fact sheet on JPATS/T-6A Texan II, can be accessed at http://www.af.mil/news/factsheets/T_6_Texan.html.

— Information provided by ASC Public Affairs

ESC SPO equips F-15E Strike Eagle with Link 16

HANSCOM AIR FORCE BASE, Mass. — Electronic Systems Center Tactical Data Link System Program Office experts are improving F-15E-flying warfighters' ability to successfully strike time sensitive targets like convoys, inhabited caves or mobile weapons.

SPO experts recently accelerated Link 16 implementation into the Strike Eagle aircraft. Link 16 is a tactical data link that delivers critical information faster via a computer link which provides significant improvements to response time. The Link 16-equipped F-15's will work with Joint STARS and other intelligence gathering assets to accomplish their mission in Afghanistan.

Air Force Chief of Staff, Gen. John Jumper, directed the SPO to accelerate the Link 16 implementation in the F-15E Strike Eagle. Once given the green light, they had 72 hours to prepare an execution plan. The plan was successfully carried out during the initial visit to Seymour Johnson AFB, N.C.

Seymour Johnson crews are providing the training to install, modify and maintain Link 16. The tactical data links SPO is now preparing to equip an additional F-15E squadron at Seymour Johnson and another at RAF Lakenheath with Link 16 capabilities.

— Information provided by ESC Public Affairs

Tests keep transport crews safe, meet real-world need

EDWARDS AIR FORCE BASE, Calif. — Experts at the Air Force Electronic Warfare Evaluation Simulator housed at Air Force Plant 4 in Fort Worth, Texas, are taking the lead in upcoming laser countermeasures testing designed to protect large military aircraft.

The test facility falls under the 412th Test Wing here. The wing was recently designated the responsible test organization for the Large Aircraft Infrared Countermeasure program, known as LAIRCM, testing on the C-17 and the C-130.

Testing will determine the effectiveness of a laser-based system designed to defeat numerous infrared surface-to-air missiles. The testing, which begins in January, is responding to Air Mobility

Command's "urgent and compelling" need to have the LAIRCM capability added to certain transport aircraft.

The need for such testing can be seen in today's conflict in Afghanistan where man-portable, heat-seeking missiles like the Stinger pose a grave threat to U.S. and allied aircraft.

This first phase of the LAIRCM testing is expected to last 12 weeks. The 418th Flight Test Squadron at Edwards will oversee integration of the system on the aircraft and conduct performance and handling quality testing in fiscal year 2003.

— Information provided by AFFTC Public Affairs

ESC delivers mission planning software early

HANSCOM AIR FORCE BASE, Mass. — Mission planning program office experts here recently provided B-1 combat mission planners with software upgrades that promise to increase performance and functional capabilities.

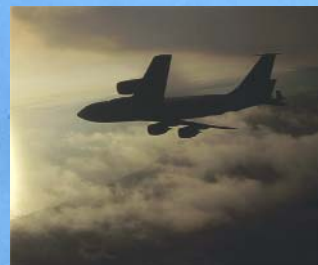
The delivery comes three months ahead of schedule with the latest B-1 Aircraft Weapon Electronics mission planning software system-five hardware being fielded.

B-1 mission planners use the B-1 AWE software upgrade with the MPS-V hardware to lay out their missions, create hardcopy products and charts, and transfer mission data to the aircraft. This new release provides significantly more flexibility in B-1 planning operations.

Accelerating the complete hardware and software B-1 mission planning environment to operational units was the result of a partnership between Lt. Gen. Richard Reynolds, Aeronautical Systems Center commander, and Lt. Gen. Leslie Kenne, ESC commander.

The B-1B Lancer is the backbone of America's long-range bomber force providing massive and rapid delivery of precision and non-precision weapons against potential adversaries anywhere around the globe on short notice. The B-1B was first used in combat in support of operations against Iraq during Operation Desert Fox in December 1998. B-1s have been subsequently used in Operation Allied Force and Enduring Freedom.

— Information provided by ESC Public Affairs



Aging Aircraft program warfighters have

Almost a year after its creation, the aging aircraft system program office, or SPO, at Wright-Patterson Air Force Base, Ohio, has achieved several milestones and discovered additional, new challenges, according to Brig. Gen. Rosanne Bailey, director.

"Our program office is responsible for developing, maintaining and facilitating implementation of a comprehensive, long-range roadmap for the Air Force's aging fleet of aircraft," Gen. Bailey said.

"We're doing this by finding cross-cutting, common solutions that improve the fleet's availability, as well as its current and future mission capabilities, in an affordable manner."

Expected growth

Also supporting the development systems manager/program manager for electronic combat, common avionics, support equipment and joint modelling and simulation systems efforts, the aging aircraft SPO has a combined annual budget of \$170 million, with total value of \$2 billion. About 100 Air Force military, civilian and contract employees now work directly for the aging aircraft SPO, which is expected to grow significantly in years to come as it assumes new taskings, according to Col. Michael Carpenter, chief, aging aircraft planning division.

"When the SPO first stood up, on Jan. 25, 2001, it was chartered to work in three main areas," Col. Carpenter said.

"These were analysis and assessment, planning and programming, and execution and integration — three extremely diverse and challenging tasks.

"The first task involves an enormous, ongoing assessment of about 6,300 aircraft currently in the Air Force inventory," he explained.

"We're also working on recommending policy and process changes to improve the way the fleet is managed, now and in the future."

Developing a plan

Inherent in the planning and programming task are several chores, chief among them development of an Air Force aging aircraft comprehensive plan, Col. Carpenter said. "We're identifying technical strategies and specific technology projects to resolve aging aircraft issues. And we're also conducting the Air Force Materiel Command Applied Technology Councils, which monitor and oversee a broad spectrum of aging fleet issues."

Execution of projects is critical to the third area, Col. Carpenter indicated. "We're committed to resolution and integration of cross-cutting issues, as well as managing the 707 Working Group, which deals with aging issues on the fleet. Our goal is to establish collaborative working groups in the Defense Department, academia, and other government agencies."

Success stories

One recent success involves the joint aeronautical commanders' group, or JACG, composed of representatives from the Air Force, Army, Navy, Marine Corps, Coast Guard, National Aeronautics & Space Administration, Defense Logistics Agency and Federal Aviation Administration, all interested in solving aging aircraft issues, the colonel said.

"We all have the problem. It may manifest itself in different ways among the agencies — but we all have the issue," Col. Carpenter said. "For some time now, the three services, Defense Logistics Agency and Federal Aviation Administration have had an aging aircraft program in existence.

"Within the past year, each of our aging aircraft offices have joined to develop a working group to 'cooperate and graduate' — none of us alone has enough resources to tackle adequately the issues we're running into, with respect to aging aircraft," he explained. "Together we've been leveraging our meager service dollars together to make more of a difference for our

ram office ensures capable weapons

combined services and agencies, with regard to solving the problems of aging aircraft.”

Combining resources

In November 2001, the JACG recognized and formalized this working group by creating its own, joint council on aging aircraft, or JCAA, working group, chaired by Gen. Bailey. “This group of services and agencies is charged with working on aging aircraft issues — all of us getting together to make more of our resources.

“It changes the emphasis of our efforts from a ‘bottoms-up’ view, to more of a shared, ‘hands-on’ support role — essentially involving all the commanders who take care of aeronautical platforms across the member agencies,” Col. Carpenter, who serves as JCAA acting chair, said. “This raises the interest level all around quite a bit, because it will bring commanders’ influence to bear upon this subject, in a joint fashion — as opposed to each service going after this on its own.”

The JCAA’s overarching, primary goal is to increase the availability of our aircraft and reduce the cost of aircraft ownership for all members, so that the age of each platform becomes a smaller economic burden to bear, the colonel indicated.

“We saw at least two things that needed to be done right away,” Col. Carpenter said. “One was to share visions and strategies in certain technology areas, system solutions that needed a certain level of concentration.

The second one was in the area of knowledge management — the ability to share knowledge about lessons learned and system solutions among ourselves — in a more systematic way.

“The initial thrust areas that we’ve chosen to work on are corrosion, non-destructive inspection techniques, avionics, wiring, and dynamic components,” he said.

“We’re laying the foundation of how the council will work within the JACG, using those initial technology thrust areas. Sometimes, it’s a

business practice we need to go fix, that’s part of the problem. Our objective is to work through the seven other boards chartered under the JACG, to get things done through them.”

Looking for new technologies

One example of a JACG board is science and technology, which looks out for technologies that represent real basic, applied and commercial research and development, the colonel said.

“This board looks out for technologies that will support the aeronautical product line,” Col. Carpenter said.

“They’re usually involved in other science and technology forums, bodies or decision-groups, so the influence of aeronautical research is being transferred into these other areas.”

Another member of the JACG board structure is program opportunities, which looks for new ways to accomplish common aeronautical goals, Col. Carpenter added. “Most of our aircraft now have ‘glass cockpits’ — glass displays, instead of the old, round dials. Many of those glass displays could be common among different service and agency aeronautical platforms.

“This particular board tries to identify these kinds of issues, to work common solutions to benefit members, keep their costs down and reduce their logistics footprints.”

The JACG’s Aeronautical Engineering Board looks for things like engineering standards, that could be applied across member units, the colonel explained.

“The logistics board seeks logistics issues such as parts obsolescence, common in avionics today with rapid turnover in the electronics industry,” Col. Carpenter said. “These boards all can have an effect on the aging aircraft issues, but somebody needs to get them focused — the JCAA now will do that.”

— Ms. Sue Baker, ASC Public Affairs





It could mean the difference between \$50 and \$2,000 for a country trying to reduce its equipment inventory. It could also mean the difference between a delivery time measured in days instead of months for a country that needs a hard-to-find item.

“What the Worldwide Warehouse Redistribution Service, or WWRS, really means is what the Air Force Security Assistance Center strives for,” said Maj. Gen. (Ret.) Claude Bolton, outgoing Air Force Security Assistance Center commander, “to get our customers the right part, at the right time, at the right price.”

The Air Force Security Assistance Center develops and executes international agreements which provide defense materiel and services to friendly foreign forces in furtherance of U.S. national security. One of the tools AFSAC uses to do its job is the WWRS.

The service is a virtual warehouse, like eBay without the auction, where foreign countries can anonymously list their excess serviceable material with available quantity and a price the country wants for the part. Unlike web auction sites, AFSAC must control the release of material to countries authorized to buy them under the Arms Export and Control Act.

“Instead of selling the material for scrap and making pennies, countries are able to list parts they don’t need, at a realistic value,” said Gen. Bolton. “Other countries can then buy the part if the sale is authorized under security assistance regulations.”

“This is the third year for our warehouse, and it is a huge success,” said Mr. Earl Sollman, worldwide warehouse program manager

“Our first year in operation, we only had one primary seller. Today, we have 12 sellers and 35 buyers, we have sold \$4.2 million in parts, and our system lists almost 6 million items worth more than \$1 billion.”

To fund AFSAC’s role, there is a 10 percent redistribution fee with a minimum charge of \$250. If a country has a foreign military sales case set up, parts can be ordered online directly from the service or through the country’s normal requisitioning channels.

To ensure customers are getting the best possible support, the customer supply office constantly monitors all customer requisitions to ensure it is on contract and the estimated ship date is current.

If an item appears to be more readily available on the service, the office or the customer can move requests to WWRS to improve requisition support, since products listed are already on the shelf.

Depots and air logistic centers can use the warehouse. If an agency finds a part they need on the warehouse website, they just have to send a military inter-departmental purchase request, or MIPR.

AFSAC then processes the requisition like a regular foreign military sales order, including the redistribution fee. The request goes to the seller to make sure the part is still available.

If it is, the seller sends it to AFSAC, they inspect the item for visual defects, take pictures, record serial numbers, and then forward it to the requester. If the purchaser finds defects which weren’t visible in the inspection, the part is returned to the seller and money is either refunded or the part replaced, according to Mr. Sollman.

“The warehouse is just one way we are trying to improve our services to the customer. The faster we can get them a quality part, the better,” said Gen. Bolton. “We are constantly monitoring our program and our customer’s requirements to determine if we are supporting them the best way possible and achieving our vision of world-class professionals fostering global partnerships.”

— Capt. CK Keegan, AFSAC Commanders Action Group

“The warehouse is just one way we are trying to improve our services to the customer. The faster we can get them a quality part, the better.”

Maj. Gen. (Ret.) Claude Bolton

B-52 supports new mission

A B-52 Stratofortress in the shop at Oklahoma City Air Logistics Center, Tinker Air Force Base, Okla., is being prepared for a “higher” calling — it’s on its way to NASA to be used for space research.

Into the space age

Although next April marks the 50th anniversary of the first delivery of a B-52 to the Air Force, the workhorse has flown into the space age thanks, in part, to the regular maintenance program at Tinker.

This B-52H, which will replace the National Aeronautics and Space Administration’s B-52B, entered programmed depot maintenance in August and is expected to return to the Dryden Flight Research Center at Edwards AFB, Calif., in March. Dryden received the B-52H from the 23rd Bomb Squadron, 5th Bombardment Wing at Minot AFB, N.D., just days before the aircraft was delivered to Tinker.

“The aircraft is here to go through a normal programmed depot maintenance process,” said Mr. Al Clark, B-52 structural engineering branch chief at Tinker. “Prior to us accepting the aircraft on the line, there were a number of items that were removed to essentially de-militarize the airplane.

“We took off much of the classified boxes and other stuff that NASA doesn’t need. That way, when NASA receives the airplane it’s a good, viable airplane.”

The normal programmed maintenance cycle for the B-52 performed at Tinker is every four years. “During the programmed depot maintenance cycle, we’ll actually take the opportunity to run some additional wires to accommodate the necessary modifications,” Mr. Clark said. “In fact, we have some NASA crews on hand

to help with that. It’s just easier to accomplish the modifications while the aircraft is opened up.”

Officials with NASA at Edwards have been seeking a replacement for the B-52B for some time and say it should provide an excellent launch platform in the future.

It’s on loan for now

The aircraft will be on loan initially from Headquarters Air Combat Command, but Tinker officials say they are working on a plan to permanently transfer ownership of the plane to NASA. “The B-52B has been on loan to NASA for a number of years and it will likely be in the Air Force inventory for the foreseeable future,” Mr. Clark said.

Mr. Matt Graham, NASA engineering operations, said most aerospace vehicles can’t reach space independently and need a little “lift” to help them reach altitude. “The vehicles we’re talking about are experimental vehicles primarily,” he said. “These vehicles don’t have any power source of their own, so we’ll use the B-52H to carry these experimental vehicles to launch altitude.

A unique mission

“The B-52 has a unique mission. No other vehicle has the function of carrying these experimental vehicles to altitude and dropping them off,” said Mr. Graham. “The B-52 provides a support service for the space vehicle in terms of power and instrumentation to monitor the vehicle while it is in space.”

Loaning NASA researchers the aircraft and continuing future support will help the Air Force meet its goal of finding cost-effective and reliable ways of getting to and from space, he said. The new air-launch aircraft will boost both NASA and Air Force efforts in researching and test-

ing technologies for future space vehicles. Myriad other flight research possibilities await the “H” model, as well.

In the future

The Office of the Secretary of Defense, NASA and the Air Force are partially funding a flight research instrumentation package to be installed on the aircraft, as well as other modifications. The aircraft will be delivered to NASA following the programmed depot maintenance, construction of a new pylon, installation of flight research instrumentation and aircraft envelope clearance flights.

“The ‘B’ model has performed a myriad of projects over the years,” Mr. Clark said. “Hopefully, the ‘H’ model will replace that. “Right now, the B-52B is capable of carrying a heavier payload under the wing, so we’ll have to make some modifications to the B-52H. Those modifications are currently in the planning stage. The B-52H is expected to come out of dock in late January and be delivered in March 2002.”

Versatile B-52 Stratofortresses served as the backbone of Strategic Air Command during the Cold War. As one leg of the United States’ nuclear triad defense strategy, B-52s, able to be recalled in-flight, offered the most flexible weapons delivery platform.

Delivery of the first B-52H model aircraft to Strategic Air Command occurred in May 1961 and the last was delivered in October 1962. A total of 102 H models were built and 94 remain on active duty.

Stratofortresses have seen action in the Vietnam War, Desert Storm, Kosovo and most recently over Afghanistan in the war on terrorism.

— Mr. Darren Heusel, OC-ALC Public Affairs



Right: B-52 mechanics, Mr. Paul Allen, back, and Mr. James Smith reinstall a bonnet on a B-52H that will go to NASA after maintenance and modifications. Middle: Ms. Jerita Kreuzberg, a sheet metal mechanic, works on the wing. Left: B-52 aircraft mechanics, Mr. Michael LeBlanc and Mr. Troy Tristow, inside cockpit, install windows on the aircraft. (OC-ALC photos)



The legendary B-52B known as "Double-Oh-Eight" undergoing a complete landing gear change at Tinker AFB, Okla., in 1993. At that time, NASA operated 0008, which saw four years of Air Force test work at Edwards AFB, Calif., before becoming the "mothership" for the X-15 rocket flights.

B-52 programmed maintenance — 50 years of supporting warfighters

— By Mr. Dan Schill

Oklahoma City Air Logistics Center Historian

The Oklahoma City Air Logistics Center at Tinker Air Force Base, Okla., began its long love affair with the B-52 Stratofortress in 1952.

The 1950's — a new era

In 1952, the Oklahoma City Air Materiel Area began preparations for the management of the B-52. In December of that year, personnel began tests to determine the adequacy of mechanized electrical accounting methods to transmit information on B-52 aircraft to and from the contractor and depots.

On June 17, 1954, the Air Force accepted the first production model of the B-52 and several months later Tinker issued a contract for an extension of a runway in anticipation of B-52 workload.

On the final day of 1954, Oklahoma City Air Materiel Area's holding account for B-52 spares to support the first Strategic Air Command wing was 81 percent complete.

Prior to the first B-52 landing at Tinker, officials petitioned Headquarters Air Materiel Command to designate them as executive director for development of logistics plans for B-52s. They presented a comprehensive weapon system support management plan that planned, programmed and provided logistics support from production of the airplane to its disposal.

Many points of the proposal were incorporated into their new weapon system management program by AMC, and the B-52 became the first aircraft to enter the Air Force inventory under the weapons system management concept.

Tinker dedicated its newly-extended runway in 1955, and the first B-52 touched down that same year. The modern bomber became a symbol of the jet age filled with challenges and complexities.

On December 7, 1955 the center received \$85 million for procurement of initial B-52 airframe component spares — an action that added to the status of the base.

In 1956 they became the support site for all B-52 supply management functions under the new management program. Tinker officials never dreamed they would be working on the aircraft more than 40 years later.

In 1958 they received executive management assignment for all models of the B-52, and later that year AMC transferred executive responsibility for B-52F models to them. Tinker became the focal point for all B-52 logistical matters except those pertaining to the B-52G.

In 1959, B-52s started to appear on the depot's maintenance line and in December, the center completed the first repair work on a B-52.

1960's — supporting the warfighters

The 1960s brought more B-52 work to Tinker in response to the Vietnam War.

The center began modifying B-52s to transport and launch GAM-77 "Hound Dog" missiles in February 1960 and in May the center received its first B-52G.

The B-52 stood on alert during the Cuban Missile Crisis and in response to that threat Tinker accelerated its B-52 aircraft and engine maintenance and modifications programs in 1962.

The center's ties to the B-52 expanded as it gained engineer-

ing responsibility for the B-52H on February 1, 1962.

1970's — increasing logistic support

In 1972 the depot instituted "Project Bullet Shot," providing increased logistics support for B-52 and KC-135 aircraft. Modification and maintenance programs came to \$212 million and 397 aircraft in that year.

In 1974, Oklahoma City Air Materiel Area became the Oklahoma City Air Logistics Center.

In 1976, Tinker completed a four-year project as it delivered its last short-range-attack-missile modified B-52 to Strategic Air Command. The project affected 15 SAC wings, 272 B-52G/H aircraft and cost \$417 million. On June 30, 1977 President Jimmy Carter announced the B-1 production program would be discontinued, thus making the aging B-52 the bomber of the future.

To equip the B-52 to survive as SACs main penetrating bomber, the Air Force undertook one of its most extensive and costly aircraft modification programs in its history — the offensive avionics system/cruise missile integration program — modifying B-52Gs to carry cruise missiles.

The Air Force estimated the programs would cost \$2.47 billion and expected it to be completed in the early 1990s.

The 1980's — modifications continue

On July 21, 1981, the first B-52G aircraft arrived for modification. In December, the center awarded a \$650 million contract to modify an additional 168 bombers to carry air launched cruise missiles and install new offensive avionics equipment. Tinker planned to modify 100 of the aircraft on base.

Griffiss AFB, N.Y., received the first modified B-52 aircraft on January 15, 1982. And on May 3, 1983 the Air Force phased out the last 35 B-52D aircraft from its inventory.

On April 22, 1988 Air Force Logistics Command announced approximately one-half of the B-52 workload would be transferred to San Antonio.

Despite the cutbacks, Tinker completed programmed maintenance on 26 B-52G aircraft and completed a safety time compliance technical order in 1988.

To close out the 1980s, Air Force Logistics Command began a pilot warranty program that guaranteed B-52 parts repaired at Tinker, a sign of faith in the depot.

1990's — phasing out the —G model

At the close of 1990, 165 B-52G and 95 B-52H models remained in operational service and major modification programs continued during the fiscal year.

In 1992, the Air Force reduced B-52G fleet to 63 aircraft and

Tinker ceased maintenance on the G model.

In order to provide a more integrated B-52H modification program, the center combined four upgrades into a single comprehensive program called the conventional enhancement modification program.

In August 1991, Tinker began the process of transferring B-52H workload from San Antonio to Oklahoma City. The project, "Pacer Buff," saw the first B-52H aircraft arrive in September 1991.

Tinker completed programmed maintenance on five —H model aircraft in 1992.

In April 1993, Tinker initiated "Coral Thrust," a detailed two-level maintenance demonstration program.

In May 1994, the last B-52G aircraft was retired. In November 1994, Tinker established the B-52 management directorate in order to better serve the B-52 fleet.

During the 1990s, Tinker performed programmed depot maintenance work on approximately 20 B-52 aircraft every year in addition to serving as the system program director.

They either performed or managed a variety of

programs to insure viability of the B-52 fleet.

Programs ranged from a high reliability maintenance free battery program and JP-8 cold start test to AGM-142/AGM-894 missile upgrades and strut problems.

Tinker also encountered a host of problems associated with keeping the aging fleet airworthy.

In 1999, the Air Force approved an avionics midlife improvement program that sought to upgrade B-52 avionics system by replacing the avionics control unit, inertial navigation system and data transfer system.

2000's — 50 years of service

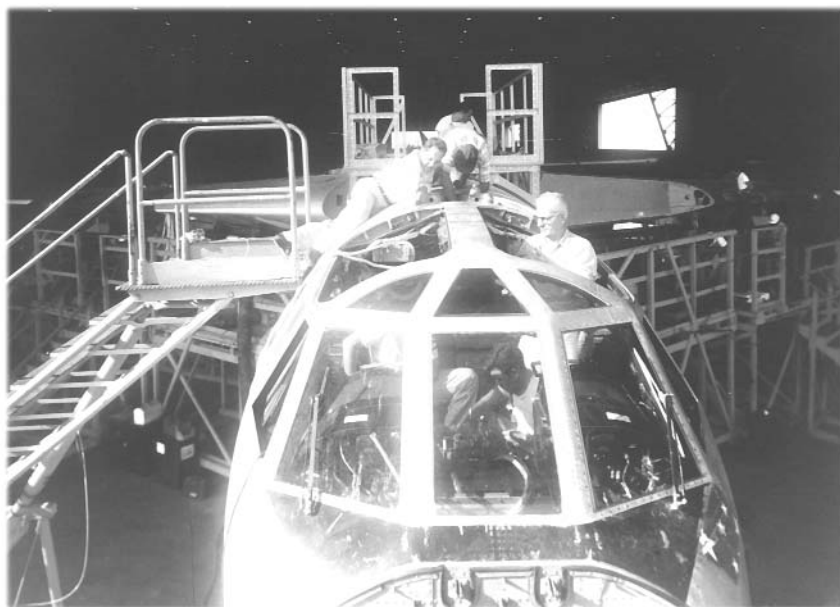
In 2000, as the B-52 approached its 50th birthday, Tinker continued to manage and perform programmed maintenance and modifications on the fleet of 94 B-52H aircraft.

Due to its age and wear, they initiated a program to install an overhauled horizontal stabilizer trim mechanism in each B-52 during its programmed depot maintenance cycle.

On June 30, 2000, Tinker awarded Boeing a contract to replace the old ALR-20A panoramic receiver system with new kits.

The proposed situational awareness defensive improvement would allow B-52s to employ long-range cruise missile outside threat ranges. In fiscal 2000, Tinker overhauled 21 B-52s accounting for \$68 million in business.

Thus, work on the B-52 continues at Tinker with more than 1,550 overhauled during its 40-plus year history at the depot.



Maintenance technicians work inside the cockpit area of a B-52 during depot maintenance of the giant aircraft. (Courtesy photo)

Data mining breakthrough benefits aging aircraft fleet

Increasing requirements placed on the Air Force's aging aircraft fleet created a need for innovative technologies to reduce escalating costs and improve the fleet's sustainability.

A group led by the manufacturing technology, or mantech division, of the Air Force Research Laboratory Materials and Manufacturing Directorate at Wright-Patterson Air Force Base, Ohio, has made a quantum leap in meeting these goals.

Forming a partnership

Together with researchers at InfoScribe Technologies, Ltd., and Veridian Engineering, the group developed the first integrated data management system for the Eddy Current Inspection System, or ECIS.

The system is a state-of-the-art inspection station for many of the Air Force's gas turbine engine disks, headquartered at Tinker AFB, Okla.

Within the current fleet, maintaining gas turbine engines cost the Defense Department \$2.2 billion in fiscal year

2000, according to information released by the Government Accounting Office. This represented 63 percent of the Air Force's gas turbine propulsion budget.

When implemented Air Force-wide, the crucial new data mine will improve safety, reduce disk replacement costs by 50 percent, increase depot throughput, and reduce the overhaul cost.

This means millions of dollars in parts acquisition will be saved.

Automatic replacement

Turbine engine disks were traditionally replaced upon reaching a pre-determined number of operating hours. The disks, made of exotic alloys, cost from \$25,000 to upwards of hundreds of thousands of dollars each.

There has been a long-standing perception that the gathering and intelligent processing of more accurate information would add precision to the calculation of engine disk life cycles, substantially increasing current life limitations and overall safety.

Manufacturing processes improved the quality and durability of engine disks, but computer technology could not provide sufficient analysis of the disk's condition.

The disks were improving, but their replacement timetables were unchanged. Technicians believe that many disks had one or more cycles left in them after being retired.

Retirement for cause

The retirement for cause program was created to improve parts inspections and locate flaws or cracks making maintenance more cost effective. Early inspections, using hand-held probes, confirmed many disks were being retired prematurely, but not enough to change the schedule of life cycle retirement.

In the mid-1980s, Veridian Engineering led a team that married state-of-the-art nondestructive inspection with fracture mechanics modeling to develop an automated method of detecting cracks or flaws. Their efforts produced the ECIS station.

The station is a large manipulator consisting of an electronic arm atop a large granite block to give it stability. An engine disk is placed on a turntable that rotates. The manipulator arm, holding a probe, maneuvers over, around and through the various surfaces of a disk, collecting an assortment of status readings.

A giant leap forward

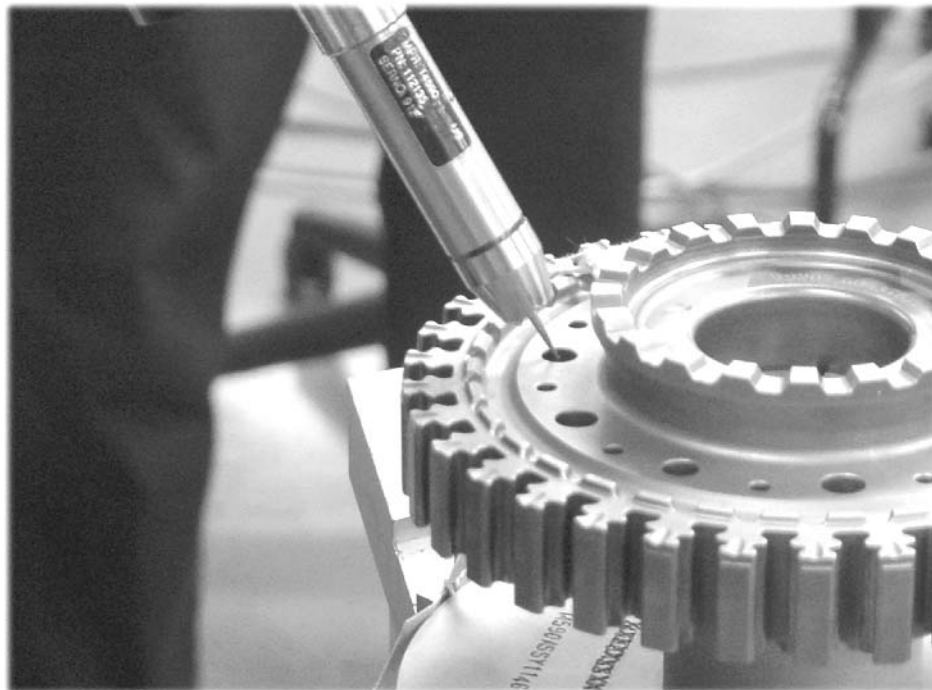
The accuracy and throughput provided by the system proved to be a huge step forward, providing Air Force maintenance officials with a clearer status of each disk.

Since the program was initiated, and the first of what is now 26 ECIS Stations went into operation at Tinker, more than \$850 million has been saved.

However, technology was still a barrier in reaping the full benefits of the system. Computer hard drives were extremely limited in storage capacity, and only capable of storing a single disk's inspection analysis until a final report was generated.

The stored data then had to be deleted

Data continued next page



An Eddy Current Inspection System probe inspecting a disk for flaws. Air Force Research Laboratory Materials and Manufacturing Directorate has teamed with InfoScribe Technologies, Ltd., and Veridian Engineering on the first integrated data management system, saving the Air Force time and money in the sustainment of gas turbine engines. (AFRL photo)

Dryden Research Center designing B-52H pylon

A new Dryden Flight Research Center at Edwards Air Force Base, Calif., pylon designed for carrying aerospace vehicles aloft will be built during the next few months by the fabrication shop at the U.S. Naval Air Warfare Center at China Lake, Calif.

The new pylon, which is a "one fits all" design, will enable the B-52H to literally "carry out" its mission.

In the past, most new aerospace vehicles taken up by Dryden's B-52B required their own new pylon.

Mr. Matt Graham, NASA engineering operations, said construction of the new pylon, which will be mounted under the right wing, is designed to accept different adaptors for the variety of aerospace vehicle shapes and sizes each new Dryden project represents.

Initially, the new pylon will be rated to carry a load weighing up to 25,000 pounds. Later modifications are planned to allow a load-carrying capacity of more than 70,000 pounds.

— Mr. Darren Heusel, OC-ALC Public Affairs



A B-52H drops a load of M117 bombs. A new pylon is being built by the U.S. Naval Air Warfare Center at China Lake, Calif., enabling the B-52H to carry out its mission. (U.S. Air Force photo)

Data continued from previous page

from the hard drive to make room for analysis from the next inspected disk. Purchasing additional hard drives was cost prohibitive at the time. In 1995-96, InfoScribe developed a data collection software application under a Small Business Innovative Research project for a different government program.

This application was capable of collecting and organizing hundreds of unique parameters simultaneously. Engineers from ManTech's Materials Process Design Branch saw the potential of adapting the application for the station. ManTech succeeded in having the companies join forces under a small business research enhancement.

Learning to interface

InfoScribe modified the software enabling communication with the system, and vice versa. ECIS control software was modified to pull data out at relevant points during an inspection, and send it to the computer.

The Veridian-built interface has allowed InfoScribe to archive the data, which is predicted to reach a storage capacity of one terabyte, or 1,000 gigabytes, per year.

Working together, InfoScribe and Veridian installed a prototype system,

using one of the stations at Tinker to collect and manage inspection data.

In a five-month period the prototype collected more than five gigabytes of data. An updated version was installed, mining more than twice that in a similar five-month time frame.

With the memory storage problem

Since the first Eddy Current Inspection System went into operation at Tinker Air Force Base, Okla., more than \$850 million has been saved.

solved, the usage measurements of each disk can be charted for comparison during subsequent inspections.

Looking toward the future

The future for this program promises even greater benefits. Representatives from InfoScribe and Veridian, along with ManTech, are working on a data mining application to reuse and reanalyze previous data to perform "simulated re-inspections" on engine disks.

The rationale is simple. Inspections are repeated by recalling archived data from InfoScribe. By interactively modifying the standard inspection parameters, disks can be inspected to smaller crack detection limits. If flaw indications are found, then all similar parts can be re-inspected without recalling engines from service, providing a powerful tool for fleet managers to assess risk.

Making a difference

This capability will tell engine life management personnel if there is a widespread problem, or just a one-time occurrence, which can mean the difference between grounding the entire fleet or not.

The underlying area this research will assist in is the determination of what is causing engine disk flaws to grow, how many and how fast.

By combining the information collected on the system with maintenance and flight data it will be possible to correlate the operational conditions to flaw growth.

This correlation is critical in determining the readiness of the fleet and maintenance cycles required based on flight profile information. This data can also be used to see if any other trends were present that might have led to a part failing.

For instance, was this part located in a very cold, humid climate, and recently transferred to a very dry, hot climate?

The amount of new data being collected has provided a quantum leap forward by improving flight safety, saving millions of dollars in parts acquisition, increasing fleet readiness, and providing the capability to expand the system's use to benefit other Air Force assets.

— Mr. Gary Cunningham, AFRL Materials and Manufacturing Directorate

Keeping warfighters equipped — Ogden directorate extends older aircraft service

One year ago at Hill Air Force Base, Utah, the Mature and Proven Aircraft Directorate was officially announced as one of Ogden Air Logistics Center's newest directorates. Today it is up and running with Col. William Murray IV engaged as director.

Consolidating aircraft

The directorate is the consolidation of three separate system program director responsibilities:

The A-10 and F-111 from McClellan AFB, Calif.; The T-37, T-38, F-5 and many other aircraft from Kelly AFB, Texas; and the F-4 that was already located at Hill AFB. McClellan and Kelly both closed in July 2001.

This effort created a directorate portfolio consisting of 37 types of aircraft systems, serving 76 countries — systems ranging from cargo and utility to trainers and fighter and attack aircraft.

"I see this as a golden opportunity," said Col. Murray. "Right now we have an opportunity to take the best ideas from Sacramento and San Antonio, meld them with proven practices at Ogden, and develop the best way to do business in an era of acquisition reform."

The aircraft systems are separated into two categories: "mature" — those no longer in production but still included in active Air Force inventory; and "proven" — those no longer in active Air Force inventory or never included in Air Force inventory, but in use by other United States agencies and foreign countries.

The term "mature and proven" should not be mistaken for antiquated, obsolete or inert; this is an organization filling an important function in national defense.

"With declining military budgets facing our nation, it's imperative we preserve and extend the service life of our older operational aircraft, exploring all avenues of engineering and logistics processes," Col. Murray said. "This approach is in action with the T-38 and A-10 programs."

Transferring authority

The designated acquisition commander authority for the T-38, A-10 and foreign military sales planes was recently transferred to Maj. Gen. Scott Bergren, Ogden ALC commander.

Numerous significant upgrades with congressional oversight are currently being performed, scheduled or planned for these aircraft; Gen. Bergren is making critical decisions expected to affect the future of these systems.



The T-38 is the Air Force's primary advanced fighter/bomber pilot trainer. Already 40 years old, the plane is undergoing structural, avionics and propulsion modifications to extend its service life through 2025. Before pilots can step into an F-16 or the anticipated F-22, they must first master the T-38.

"The only replacement we have for the T-38 is the T-38 — we need to take care of it," said Col. Byron Nash, Air Education and Training Command, chief of requirements division, Randolph AFB, Texas. "Former Chief of Staff of the Air Force, Gen. Michael Ryan, charged AETC to produce 1,100 pilots per year. To accomplish this, the mature and proven aircraft directorate and AETC must work as a team to ensure we have a quality trainer in the air."

Built for survivability

The A-10 has a similar life extension tasking — extend service life from the current 8,000 flying hours to 16,000 flying hours — taking this aircraft into the year 2028. A mini attack entourage on its own, this plane was built around a 30 millimeter Gatling gun, which is the center point of the aircraft.

"It was built for survivability," said Mr. Frank Garcia, deputy for the A-10. Redundant systems throughout the A-10 enable it to fly despite taking damaging hits.

The project, "Hog Up," focuses on refurbishing the wings on the A-10 fleet. Expected projects for the aircraft will focus on structural, avionics, electronics and weapons modifications.

Due to Air Force interests in the T-38 and A-10, much of the mature and aging aircraft directorate's spotlight is focused on them. However, the "proven" aircraft cannot be ignored.

There are 33 types of aircraft systems that have a customer base numbering more than 70 countries and several U.S. agencies including, the Bureau of Alcohol, Tobacco & Firearms and the U.S. Forest Service.

It's getting bigger

According to Mr. John Berry, chief of proven aircraft division, there is a lot of "goodwill" customer relations that can be fostered by this directorate. The OV-10 and AC-47 used by Columbia for drug interdiction is one example. The F-4 and F-5 will be the most active programs for the proven division.

To accomplish the directorate's mission — Support customers' operation readiness and national objectives by providing logistical, engineering, technical and contracting support worldwide — the directorate, which is still growing, will number 350-400 active duty and civilian personnel in the future.

— Ms. Sharon Dore, Mature and Proven Aircraft Directorate



AEDC returns national test asset to duty

Arnold Air Force Base, Tenn., testing experts and government and industry officials hope to increase capability and affordability as they return the Air Borne Icing Tanker, retired five years ago, back to duty.

AEDC experts are collaborating with officials from TYBRIN CORP, the Federal Aviation Administration and the Department of the Navy to return the AIT to duty, with military and potential civilian applications in mind.

In 1996, due to economic pressures, Defense Department officials decided to retire the original AIT, a KC-135A, from military service because of unsupportable maintenance costs and no military need for the aircraft in the immediate years.

Dual mission

"From the military perspective, the AIT's role was to test airborne weapons systems and increase assurance that a system will meet its operational mission in worldwide ice and rain weather conditions," said Mr. Saul Ortigoza, Air Force Flight Test Center AIT project director. "Its other role is to increase assurance that the loss of human life or weapon systems, will not occur due to ice and rain.

"From a commercial perspective, it's my opinion that the same outcome is desired from commercial aircraft manufacturers and the airlines as well," he said.

The AIT is a modified KC-135 aircraft equipped with a water spray system. The system is used in aircraft flight tests to produce realistic rain and icing conditions in front of other aircraft to investigate their performance under those conditions.

Funded by the Defense Department Central Test and Evaluation Investment Program and the FAA, the project is redesigning a KC-135 model R to assume

the role of the former KC-135A. The project's goals are to make the AIT system better and more affordable for the user and to extend capabilities beyond the military requirements to those needed by the FAA, Mr. Ortigoza said.

Mr. Ortigoza said the project developer had two choices to ensure an aircraft's ability to fly in the natural environment. One is to take an aircraft and expose it to the natural ice and rain environment.

"This would expose the aircraft to a high-risk situation that may render the vehicle unrecoverable, probably destroying the aircraft and potentially killing the flight test aircrew," he said.

The developer also incurs schedule constraints because they have to find the ideal weather conditions that they want to test. These tend to exist only during certain times of the year which impacts schedule and cost, he said.

"One aircraft was flown to Argentina to test in a supercooled large drop condition," Mr. Ortigoza said. "Another aircraft made arrangements to fly to Nova Scotia, Canada, to test for icing conditions."

Mr. Ortigoza said the AIT was a second solution for a developer, because it offered the capability to test anytime, anywhere within design specifications in icing and rain atmospheric conditions, earning the AIT the notoriety of being a one-of-a-kind national test asset.

Redesign is essential

Mr. Ortigoza said AEDC's contributions to the KC-135R's redesign are essential and came about for two reasons.

"The first was its experience with adverse weather testing of aircraft engines and components," he said. "The second reason was Mr. Tom Tibbals."

Before coming to AEDC to work in the

applied technology department, Mr. Tibbals worked with the AIT system at Edwards AFB, Calif. His work there, and his work with adverse weather testing at AEDC seemed to make him the ideal person to be chief engineer for the overall program, a position he's fulfilled since 1999.

Facing new challenges

"For the new AIT, challenging requirements include higher speeds and quick reconfiguration to a refueling boom," Mr. Tibbals said. "The spray array is also heavier than the old circular array but is a lower drag configuration, because of the use of airfoil-shaped spray bars.

"AEDC analyses have shown the boom design is adequate to withstand the structural loads, and we have contributed to the design for quick reconfiguration," he continued. "Quick reconfiguration is essential to making it cost effective by allowing a single aircraft to cover multiple missions, thus increasing its utilization up into the range of other similar aircraft."

AEDC contributions and quick responses have enhanced the long-term working relationship with AFFTC, Mr. Ortigoza said. It has broadened the interactions between the ground-test and flight-test communities, demonstrated AEDC's capabilities in areas AFFTC experts typically did not consider for them, and creates the potential for AEDC testing, design, analysis and manufacturing business when problems are discovered during flight tests or other needs are identified in AFFTC programs.

— Ms. Danette Duncan, AEDC Public Affairs

Title photo of the inside of a KC-135 cockpit courtesy of Rockwell.



AMARC keeps warfighters ready to fly

— **Ms. Terry Vanden-Heuvel**
AMARC Public Affairs

Nestled between mountain ranges and desert flora lies an air force in waiting at Davis-Monthan Air Force Base, Ariz. The Aerospace Maintenance and Regeneration Center, or AMARC, is a 2,600-acre site with a cache of approximately 4,500 aircraft.

Birdseye images are developed from the neatly parked rows of aircraft. Many of these aircraft will resume their mission with other armed forces or perhaps perform duties for civilian entities. Others will eventually serve as museum or static displays as constant reminders of our Armed Forces' rich history.

Supporting the warfighter

Since the first B-29s and C-47s were brought to AMARC in 1946, the center has evolved into a dynamic aerospace storage and regeneration complex providing aerospace maintenance and asset regeneration to its customers for the sustenance of the warfighter.

Since 1965, when the Air Force was designated as the Defense Department's single manager for extended aircraft storage, AMARC has operated as an interservice activity working in close partnership with the Navy, Army and Coast Guard.

The Tucson, Arizona area offers two ideal advantages for long-term storage of aerospace equipment. The region's low rainfall and low humidity assist in already aggressive corrosion prevention efforts and the sun-baked soil makes it possible to tow and stage aircraft without the expensive construction of concrete ramps.

AMARC's three key processes, process

in, process out and reclamation are supported by a highly-skilled workforce of more than 500 employees, a majority of who are multi-skilled to perform maintenance on approximately 69 different model, design and series aircraft.

Processing in

Process in prepares aircraft upon arrival for either short- or long-term storage. In fiscal 2001, AMARC processed 101 aircraft into storage, valued at more than \$887 million.

Long-term storage is designed to maintain the functional and material integrity of aircraft systems and components for extended periods of time.

Aircraft with a high probability of returning to service are placed in this category which is considered valid for 48 months and requires periodic maintenance or integrity checks. After a 48-month interval, these aircraft undergo represervation which involves removal of Spraylat, a sprayer applied latex protective coating, running up the fuel and engine systems, correcting all preservation deficiencies and reapplication of materials.

Aircraft placed in long-term storage may be downgraded to the next type of storage — reclamation storage. The integrity of these aircraft is maintained, but systems, parts and assemblies may be removed and returned to the supply system to support flying operations.

Flyable hold storage is short-term for aircraft brought here on a temporary basis perhaps awaiting foreign military sales negotiations or reassignment to another unit. These aircraft are maintained in a near-flight-ready status with minimum preservation.

Aircraft with no future mission, or

those which have been reclaimed of all vital assets, are placed in the disposal storage category.

Prior to being placed in storage, personnel remove guns, ejection seat charges and classified or pilferable items from the aircraft.

The fuel system is drained and replaced with a lightweight oil only to be drained again leaving a film that serves to protect and preserve the fuel system. Each engine is manually rotated to ensure a protective coating against corrosion.

The aircraft's tires and hydraulic systems are serviced and it is towed to the wash rack, where it is washed and treated with a corrosion inhibitor.

Preserving assets

Under the reclamation shelter employees work to cover engine intakes, exhausts and any gaps or manufacturer cracks in the upper portion of the airframe with paper and tape. The taped areas and other easily damaged surfaces such as fiberglass radomes, fabric control surfaces and canopies are protected with the vinyl plastic compound called Spraylat. The first coat is a black compound applied to keep out water and protect windows and canopies from blowing dust storms.

A white Spraylat applied over the black acts as a temperature control, keeping internal temperatures cooler than the extreme desert temperatures. The underside is protected from intrusive desert wildlife but remains unsealed to allow free circulation of air.

AMARC inventory control numbers are stenciled on every aerospace asset prior to placement in desert storage and a parking code is assigned to each identifier to facilitate tracking during movement.

During the period 1980 through 2001, AMARC averaged 353 aircraft arrivals per year and during the same time period, an average of 76 aircraft or 22 percent departed every year.

Process out is the focal point for regeneration. Seventeen aircraft were withdrawn from storage and restored to a flyable condition here last year alone.

Reclamation process

AMARC's reclamation process, which removes parts and assemblies from stored assets is keeping the services' active inventory flying. At times, this may be the maintainer's only lifeline to keeping an aging aircraft operationally ready; in many cases, the parts are no longer available or are out of production.

Priority removal actions are the result of an urgent and unforeseen requirement that can't be satisfied through normal supply and requisition channels.

Programmed reclamation of parts restocks supply shelves and satisfies long-range forecasts on a routine basis. All of the removed parts, depending on a customer's requirement, are cleaned, inspect-

ed, bench checked and packaged prior to shipment.

Vital role in peacekeeping

It's not unusual to satisfy Defense Department customer requests from halfway around the world and recent conflicts have elevated the necessity for AMARC to support our services in the worldwide commitment for peace.

As an example, AMARC played a vital role last year in keeping the operational B-52H fleet from being grounded for a defective parts problem with the aircraft's ejection seat.

Workers reclaimed, cleaned and shipped ejection seat handles from stored B-52G aircraft to Barksdale AFB, La., and Minot AFB, N. D.

AMARC also provided an immediate stopgap last year by shipping seat adjustment actuators to grounded F-15 maintainers enabling the operational fleet to remain mission capable until new parts could be commercially manufactured.

The reclamation of these stored aerospace assets becomes a direct cost avoidance to the American taxpayer —

reclamation crews removed and returned 18,896 aircraft parts, valued at \$740 million last fiscal year.

During this period, AMARC's operating expense was \$45 million — an impressive ratio of return.

A national resource

It is evident that not in concept, mission or operation does AMARC qualify to be known as either a "boneyard" or an aircraft "graveyard," but a national resource which will continue to respond to the Air Force's current and future initiatives to keep the aging fleet operational while at the same time remaining cognizant of the necessity to keep the warfighter airborne and ready for the fight.

To meet these challenges, AMARC will continue to posture facilities and capabilities to support its customers' requirements and it's ability to sufficiently plan for a changing and challenging environment will ensure its continued success into the 21st century.



The Aerospace Maintenance and Regeneration Center at Davis-Monthan Air Force Base, Ariz., consists of 2,600-acres where more than 4,500 aircraft are stored. Some of the aircraft will resume their mission, others have parts and assemblies removed to keep the active inventory flying, and still others end up in museums or as static displays. (AMARC photo)

AFRL experts ensure Air Force flies high

When aircraft materials or systems malfunction, experts from Air Force Research Laboratory's Materials and Manufacturing Directorate at Wright-Patterson Air Force Base, Ohio, try to determine what went wrong and work with their partners in aviation to find safe, reliable and affordable solutions.

The directorate's materials integrity branch is comprised of experts in electronics failure analysis, structural failure analysis, nondestructive evaluation, coatings, composites, electrostatic discharge and paints, sealers and adhesives. Through the years, this team has been called on to solve many materials challenges.

Providing a lifeline

Aircraft wiring is an example. More than 20 miles of electrical wire snake through a jet fighter, and a bomber contains more than 150 miles. This wiring provides a lifeline that connects electrical systems with components used to operate aircraft's flight navigation and communication systems. A short or failure anywhere in the wiring can have severe consequences.

"The wire bundle insulation in many older aircraft, under certain conditions, can fail catastrophically," said Mr. George Slenski, the branch's electronic failure analysis group leader. "An electrical short can rapidly propagate into adjacent wiring causing loss of multiple systems. At times, this has led to major damage to aircraft wiring and required aircrews to declare emergencies. Most times wiring failures result in aircraft downtime, which can greatly increase the maintenance burden that results from troubleshooting and repair of aircraft."

Pushing to the limit

Because service life of many Air Force aircraft are pushed to extreme limits, the group's experts have vigorously battled a number of problems caused by aging wiring.

The group's battle with aging wiring isn't limited to aircraft. In 1999, the space shuttle lost two of its main engine controllers five seconds after it launched. Engine controllers are back-up systems allowing the shuttle to complete its mission. The shuttle program was grounded and NASA requested Mr. Slenski's input as part of an independent assessment team that evaluated space shuttle maintenance practices. Experts from the wiring assessment team identified several issues requiring immediate action.

They inspected two of the shuttles, identifying ways to determine aged wire damage and steps to take when examining the entire fleet. They also identified pre-existing damage that may have been caused by earlier maintenance. The team briefed NASA management on their findings, which resulted in the wiring problems being corrected and the fleet returning to flight.

The hardest part is when it's over

The failure analysis group solves problems related to aging wiring by studying ways material might fail on aircraft, and how it could cause additional wiring damage. "The toughest part of the job begins when analysis of a problem is complete," said Mr. Slenski. "We have to clearly communicate critical elements of our analysis to the group responsible for preventing possible future incidents. We also attempt to communicate in general terms our findings to the aerospace community through published reports and various briefings and presentations."

In addition to extensive in-house work in wiring, the group



Mr. George Slenski, right, studies space shuttle wiring. Mr. Slenski worked as part of an assessment team, evaluating space shuttle maintenance practices and briefing them to NASA management. (AFRL photo)

collaborated with the aerospace community, including the Navy, Federal Aviation Administration and NASA, to develop and transition an insulation system that increased thermal stability, mitigated arc propagation, improved wire's durability and made the wire more flexible. Recognizing the need for the improved insulation material in both new and aging aircraft, Mr. Slenski and his fellow researchers worked hard to convince the aerospace industry production of this material was in their best interest.

"This improved insulation system is now being used on many military and commercial aircraft, including our newest, most advanced fighters," he said.

Known for its solutions

Defense Department branches and peers in the commercial aerospace field are not uncommon. The group has worked with Army, Navy, Departments of Justice and Transportation, Boeing Company, and many others. Within the Air Force, the group provides support for air logistic centers and system program offices.

The group's efforts to communicate wiring-related issues and generate awareness of electronic failure analysis has established AFRL as the national research and development facility for solutions. In fact, senior officials from Defense Department and White House Office of Technology and Policy requested they participate on a team for defining national strategy in this area.

A step in the right direction

"The program the White House has initiated will allow us to coordinate with other Defense Department services, FAA and NASA to establish a national strategy for dealing with these issues," Mr. Slenski said.

"This collaboration will help us to improve reliability and reduce ownership costs of aircraft systems, proactively develop better diagnostic and prognostic tools for managing wiring, and develop better materials for aircraft wiring," he said. "Taking these steps in the right direction together will ultimately decrease the amount of maintenance time required to maintain military and commercial aircraft and will improve our mission readiness."

— Mr. Timothy Anderl, AFRL Materials & Manufacturing Directorate



Air Force photo by Mr. Albert Santacrose

AFRL remembers those who died Sept. 11

ROME, N.Y. — Members of the color guard at the AFRL Rome Research Site prepare to raise flag during ceremonies Dec. 11 marking the three-month anniversary of the Sept. 11 terrorist attacks on the U.S. In conjunction with observances around the world, the national anthem was played at 8:46 a.m. — coinciding with the time the first hijacked aircraft struck the World Trade Center in New York City.

— Information provided by AFRL Public Affairs

ASC installs eighth largest computer system in world

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — It took four semi trucks to deliver the eighth largest computer in the world to the Aeronautical Systems Center's Major Shared Resource Center here.

Part of an upgrade known as Technology Insertion 2001, the system is one of a series of upgrades to ensure that their computational capabilities increase to meet the ever-expanding needs of the warfighter.

Its 836 processors will operate at 1,000 MHz each, giving a peak performance capability of 1.67 trillion calculations per second — enough raw computational power to process all income tax returns for 2001 in half a second.

Researchers from the Defense Department, Air Force Research Laboratory, academia and industry use the high performance computers to assist in solving complex technical problems.

The Air Force contracting team award-

ed a \$12.8 million contract to Nichols Research Corp., a unit of the Computer Sciences Corporation, Aug. 24.

CSC will integrate the computer system as well as provide upgrades to the other existing computers in the center.

— Information provided by ASC Public Affairs

Podracer replica displayed at U.S.A.F. Museum

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — An exhibit named *Science Fiction to Science Fact* recently went on display in the U.S. Air Force Museum's Modern Flight Hangar here.

In a scene from *Star Wars: Episode I The Phantom Menace*, hot rod machines roar over the landscape at speeds exceeding 550 miles per hour. Young Anakin Skywalker pilots his craft to victory, levitated over the rocky racecourse and propelled by engines held together by an energy binder.

This fictional scene is made reality as the 46-foot-long Anakin Skywalker's Podracer replica is held suspended from the ceiling of the museum's modern flight hangar, combining two jet engines tethered to an open cockpit, appearing to speed over a desert landscape.

Visitors can become part of Star Wars, by taking the controls in LucasArts and Nintendo's *Star Wars: Episode I: Racer* video game at one of two game stations. This exhibit investigates the idea that the outer reaches of human imagination can transform the possibilities of science and technology into reality.

The exhibition will remain on display at the U.S. Air Force Museum until June 2002.

— Information provided by U.S. Air Force Museum Public Affairs

Robins students gather goods for those deployed

ROBINS AIR FORCE BASE, Ga. — Giving back to those men and women who are protecting their freedoms is what students at Richard B. Russell Elementary School in Warner Robins wanted to do courtesy of the treat-a-patriot project.

The idea for the pre-kindergarten through fifth-grade students to show their support for deployed troops came about during November's Red Ribbon

Campaign, according to Ms. Rochelle Smith, Russell's guidance counselor. She said items ranging from deodorant, hand lotion and disposable razors to stationary, postage stamps and bottled water were delivered to the Robins Family Support Center Nov. 19. She said each grade level was given a list of items to bring.

Due to the classified locations of the deployed troops, the care packages were mailed from Robins.

— Information provided by WR-ALC Public Affairs

Drug reduction program earns DOD honors

EDWARDS AIR FORCE BASE, Calif. — A community approach to creating a drug-free Edwards earned the Drug Demand Reduction Program the 2000 Secretary of Defense Community Drug Awareness Award.

The annual award recognizes command efforts to educate military members, their families and the broader communities where they serve, to the dangers of drug abuse and to appreciate the benefits of a drug-free lifestyle.

Among the programs the award nominations cited are:

- 95th Security Forces Squadron efforts to train youth through the Drug Awareness and Resistance Education program.
- The DEFY program trained 21 of Edwards' youth during the award period. The program takes place in two phases: Phase I is a summer camp-like week of activities with mentors leading the children through a series of interactive exercises; Phase II continues the program throughout the school year with mentors working with the children one-on-one or in small groups.

• The health and wellness center offers a host of programs to help people learn to take better care of themselves. These include smoking cessation, stress reduction, basic nutrition and suicide prevention classes.

• Family advocacy, the family support center and the local school district teamed to create the teen peer mentorship program, helping students deal with issues relating to drugs and alcohol, school violence and gangs.

— Information provided by AFFTC Public Affairs

Flexiform Press produces quality parts in record time



There's something new at Hill Air Force Base, Utah, in the Aircraft Directorate's Technical Repair Division — a Flexiform Press that can manufacture structural items and skin panels from a large variety of materials.

"The press can make parts for any weapons system," said Ms. Norine Wayment, sheet metal manufacturing supervisor. "The capability could increase our workload 10-fold."

The Swedish machine took nearly two years to obtain, but once on base, a Swedish team installed it in two months.

The system takes the place of hammering and hand-molding parts, therefore "saving time and money," said Mr. Curtis Cottrell, aircraft directorate mechanic.

"We used to use hammers to mold the parts by hand which took hours," said Mr. Kent Davis, aircraft directorate mechanic.

"The machine uses 14,500 pounds of pressure to form the raw material into whatever shape you need," he said. "In about 10 seconds you have a part that's higher in quality than even the most experienced person could do by hand."

Parts are made by placing a mold into a 25,000-pound tray that slides in and out of the machine. Then raw materials are placed on the mold and covered with polyurethane or rubber-type material. The tray is then slid back into the machine and pressure is applied by a tank filled with castor oil. This causes the raw material to form into the part.

The press can make parts in aluminum alloys, stainless steel and titanium, including deep drawn parts in high-strength and heat-resistant materials. It can also form both heat-treated and heavy-gauge materials in varying material thickness, with close tolerances, including undercuts, flanging and trimming.

In addition, the press can use existing molds that were actually made to produce parts by hand, Mr. Davis said.

However, if a new mold is needed, only half of a mold is made. In the past, parts were formed by two mold halves coming together. Because of the pressurization, the new system only requires half of a mold.

"It's revolutionizing the way we do business," Mr. Cottrell said. "It's exciting — our customers get a quality product in a shorter amount of time."

As with all new equipment there is a learning curve, but employees are trained and ready to manufacture any part a customer might need, Ms. Wayment said.

Government agencies in need of parts can contact Mr. Steven Pena at 801-586-0310.

— Ms. Sue Berk, OO-ALC Public Affairs



C-130 paint shop 'leans' into cutting flow days at Robins

The first Integrated Lean Repair events in the C-130 System Program Office paint shop made significant improvements in many areas, and the improvements have personnel excited about the future of lean.

A safer place

Mr. Kenny Boutwell, paint/depaint shop supervisor, said the list of significant improvements made by this initiative include the reduction of one depaint flow day, reductions in environmental volatile organic compounds, or VOCs, emitted and a safer place for workers to do their job. "We have just scratched the surface," Mr. Boutwell said. "We've got a long way to go, but there are a lot of things we can do, a lot we have done, and a lot we can do in the future."

During this event there was a 39 percent improvement in the reduction of excess tools, materials and equipment, a reduction in the number of depaint chemicals used from nine to three, reduced storage space by 228 square feet and a cost savings of almost \$375,000 a year.

"As is evident, the main accomplishments of this lean event include the reduction in flow days, an increase in production, safety and the quality of life for the workers, and significant cost savings," said Mr. Boutwell. "We are very proud of our team."

Mr. Boutwell said the shop began this

initiative on what is called a seven-day schedule of ball system depainting, meaning that it took seven days for the aircraft to complete the process of depainting.

With the help of new chemicals and better equipment, that schedule has now been reduced, Mr. Boutwell said.

Success through "Six S"

Mr. Boutwell went on to explain the "Six S" principal, which stands for safety, straighten, sort, scrub, standardize and sustain, as the basis of lean in production.

"This basically means taking a really good look at yourself," he said. "This was a real focused effort to take care of the items and initiatives that are crucial and important to the guys down here in this building. They are faced with a lot of chemical hazards, so the information about decreasing VOCs is very important for employees and the environmental concerns we are faced with everyday," said Mr. Mike Watson, chief lean agent.

Involving the workers

Mr. Boutwell said one of the ways the system has worked so well is by getting the workers on the floor involved.

"Suggestion forms were passed out to the workers and everyone in the C-130 system program office was briefed about lean and given the opportunity to ask questions or give suggestions. The participation from the floor has been great," he said.

"This gives the mechanics a chance to get their ideas and initiatives out in the open and we can get a team out to work them."

"Lean has a very high visibility right now; nothing lays around. If it's brought up, we have teams that work those initiatives and get the answers."

As a way to keep all employees informed, bulletin boards that plot the current status of the items being worked, and those that have been completed, are posted around the buildings.

Employee suggestion forms, as well as monthly newsletters which feature those workers whose suggestions have been implemented, are also available.

They're all involved

"There is a lot of feedback to the work force about what's going on in the C-130 production division as far as the lean projects," said Mr. Watson. "Just these initial projects have really enhanced the mechanics to offer suggestions as well as management and branch chiefs. And that is a plus."

"Everybody in this shop put something forth in this effort, and that is really nice to see," said Mr. Boutwell.

— Ms. Lanorris Askew, WR-ALC Public Affairs

U.S. Air Force Photo by Master Sgt. Dave Nolan

Doing it 'Wright'

Those magnificent men and their flying machine

Just 100 years ago this month, Wilbur and Orville Wright — the original do-it-yourselfers from Dayton, Ohio, who finally achieved manned, powered flight on Dec. 17, 1903 — scrapped everything they knew about aviation, and started all over again.

According to Dr. Joe McDaniel, historian and industrial engineer in the Human Effectiveness Directorate, Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, the Wrights went back to the drawing boards — and changed aviation history forever — because of what they learned from glider experiments at Kitty Hawk, N.C., in 1901.

It all began here

“The Wrights chose Kitty Hawk for three reasons: wind, sand and isolation,” Dr. McDaniel said.

“Kill Devil Hills, where they flight-tested three different cloth-and-wood gliders, sits on the ‘outer banks’ of North Carolina, near the Atlantic Ocean,” he continued. “Today, the area features vacation homes, hotels, restaurants and shops. One hundred years ago, though, it was nothing but sand, populated largely by wildlife and a handful of hardy, skeptical Southerners.”

The Wrights wanted to fly in a strong, steady wind because it was safer, he said. “Once an aircraft is airborne, it moves relative to the surrounding air. The Wrights reasoned correctly that if they flew into a strong wind, their ground speed would be less.”

Proceeding with caution

Likewise, if they crashed, they would crash at a slower speed — which would mean less damage to the glider and the pilot.

“The Wrights also wanted a soft place to land, and Kitty Hawk’s sand was ideal. No trees. No rocks. Nothing hard to run into,” Dr. McDaniel said.

“The Wrights liked the fact that this

area was almost totally deserted, unlike Indiana Dunes National Seashore, about 30 miles southeast of downtown Chicago, where Octave Chanute tried to fly a hang glider in 1896-97,” he said.

“Even though the 70 to 100-foot dunes were perfect for launching flights, they also drew crowds of gawkers, who often found themselves unintended targets for Chanute’s barely-controllable glider,” he said.

They were ridiculed

And though they kept to themselves and desired isolation, the Wright brothers were openly ridiculed by local residents, Dr. McDaniel said.

“Anyone who even talked about aviation in 1900 at best was considered a fool and probably even crazy. In fact, Kitty Hawk resident Capt. William Tate opined that most folks thought the Wrights a couple of nuts. Harmless, maybe — but definitely batty.”

A local witness to the brothers’ efforts, Mr. John Daniels, shared his thoughts about the Wright’s antics.

“When they first came down to Kill Devil Hills in the summer of 1900 and began to experiment with funny-looking kites, we just thought they were a pair of crazy fools,” said Mr. Daniels. “We laughed about ‘em among ourselves. But we soon quit laughing and just felt sorry for ‘em, because they were as nice boys as you’d ever hope to see. Well, they hadn’t been down there long before we just naturally learned to love ‘em — such nice boys wasting their time playing with kites and watching the gulls fly,” he continued. “They were such smart boys — natural-born mechanics — and could do anything they put their hands to.”

Trying to recreate history

This past September, Dr. McDaniel and two other local aviation enthusiasts returned to Kill Devil Hills, in an attempt to recreate the Wrights’ historic glider



Orville and Wilbur Wright, from Dayton, Ohio, are credited with changing aviation history when they achieved powered flight in 1903. (Courtesy photo)

experiments, with apparently little improvement in the arduous flight test conditions of the past.

“Wind and sand were definitely there,” Dr. McDaniel said. “Usually, the wind is strong, which means the sand always is always blowing. When the wind blows more than 15 miles per hour, the grains of sand sting as they hit your skin. The sand gets in your eyes, and rubbing sand-filled eyes is excruciatingly painful.”

It was crunchy

Not to mention tasty, if you like grit. “The sand gets in your food,” he said. “Whatever you eat is crunchy-style. The moister the food, the more the sand sticks to it. When you drink, the moist mouth-print on your cup is covered with a fine powder of sand. Your skin is covered with sand. The local people call it ‘sugar cookie.’”

Flying a glider at Kitty Hawk is more than just difficult — it’s grueling work, Dr. McDaniel admitted.

“Half our efforts were spent in carrying the 108-pound glider hundreds of feet from our camp to the sand hill, where it could be flown only on ‘high wind’ days,” Dr. McDaniel said. “And depending on which way the wind blew, at least one trip involved carrying the glider an endless distance against the wind — very exhausting.”

As the team lifted the glider, it also had to push and pull it along toward the launch site, due to extreme drag produced by wings, struts, and wires.

Up, up and away

“We tilted the windward edge of the wings up, so the air lifted the glider like a kite,” Dr. McDaniel said. “This reduced the amount of weight lifted, but also increased the drag and the effort to push or pull it.”

And the wind was often gusty, he said. “About the time we got the glider balanced in the wind, it slowed a little, and we had to fight to re-balance it. In some ways, it is like walking a huge dog that’s leading you along some of the time. By the time we got the glider to the hill, we were absolutely whipped.”

It usually took at least three people to launch the glider — one guide on each wing tip and the pilot in the opening in the lower wing, Dr. McDaniel said.

“For launch, the front of the wings was tilted up so the wind took the aircraft

weight, as the pilot climbed into a prone position with elbows resting on the front wing spar, stomach resting on a board between two lower wings, and hands and feet on the controls.

A short flight

The posture was very uncomfortable — but the flights were blessedly short, lasting just a few seconds.”

If the wind is strong enough, the two helpers on the wing tips pushed more than lifted, letting the air take the glider, he added. “Sometimes, the wind was not strong enough for launch, so the helpers had to run down the hill to gain enough airspeed for release.

“It didn’t fly very high — only two to eight feet above the sand,” he said. “Because of the strong headwind, the glider’s ground speed was very low, and the landings were soft.”

Getting the glider back up the hill was easier, due to the fact that the wind pulled it and the volunteers along easily, much like a kite going upward, he said.

During the Kitty Hawk glider experiments, the Wrights learned to cope with the ceaseless wind and sand, modifying glider designs to work with the elements rather than against them, Dr. McDaniel indicated.

“The frame of the 1900 glider was flat on the bottom, with the front elevator sticking straight out from the lower wing.

Sometimes when the glider landed, the front elevator stuck into the sand like a dart, bringing the vehicle to a sudden stop, occasionally causing the frame to break, and always punishing the pilot, who was catapulted — usually headfirst — over the front wing spar.”

The 1901 glider featured sled runners underneath, Dr. McDaniel said. “To keep it out of the sand, the front elevator was several inches above the skids.

“Even the control rods used to move it were shaped like sled runners, to keep them from digging into the sand,” he continued.

“The 1902 glider also had sled runners to support the front elevator, and more sled runners under the lower wing, to give the pilot a little more ground clearance,” he said.

“The Wrights — always frugal — recycled the skids under the lower wing, as well as the vertical struts between the upper and lower wings, from the 1901 glider to the 1902 version,” Dr. McDaniel continued.

Changing history

What the Wrights learned from gutting out these rudimentary, difficult glider experiments helped them reach that later, pinnacle event that forever changed aviation history 98 years ago.

— Ms. Sue Baker, ASC Public Affairs



Mr. Joe McDaniel (left in baseball cap with rope in hand), a historian and industrial engineer in Air Force Research Laboratory's Human Effectiveness Directorate, holds on to a full-scale replica of the Wright Brothers' 1901 glider during a recreation test-flight. Mr. McDaniel was part of a team of volunteers who attempted several flights in September and October 2001 to better understand how the Wrights discovered the secrets of manned, powered flight. (Courtesy photo)



— **By Gen. Lester Lyles**
AFMC Commander

One of the distinct blessings of being the leader of a military unit is the privilege of recognizing your people for their sacrifices, dedication and enthusiasm under extraordinarily difficult conditions. Never is this more appropriate than at the end of a difficult and demanding year.

As commander of Air Force Materiel Command, headquartered at Wright-Patterson AFB, Ohio, personally recognizing your people can be incredibly difficult when there are more than 80,000 military and civilian workers at locations worldwide.

I don't often get the chance to tell people face-to-face how impressed I am by their daily devotion to duty and professionalism, especially in light of the tragedies and challenges we've faced as a nation since Sept. 11.

That's why I'm telling you what a great job the people of AFMC are doing for our

country. It is my hope that by highlighting some key accomplishments, you'll carry with you a better appreciation for the men and women of this command who serve their country and communities so proudly.

Supporting the warfighters

Every day, these unsung heroes are living up to the challenges that come with supporting America's warfighters, and they are doing it very well. In many ways, operations in Afghanistan have been a proving ground for the innovative weaponry provided by AFMC people.

Every sortie launched, every target confirmed, every bomb dropped and every radio contact completed in support of our war on terrorism happens because AFMC people — charged with implementing an annual budget of more than \$40 billion — continue to anticipate and meet the needs of America's warfighters.

AFMC has a responsibility for, and a commitment to, managing the research, development, acquisition and sustainment of every weapon system in the United States Air Force. We develop, test and

field those systems to keep America's warfighters capable of defending freedom anywhere, anytime.

And it's your fellow citizens — members of AFMC — who provide the vision and technology for this country to win present and future wars. In fact, our scientists and engineers are right now fighting a war 20 years in the future, developing and understanding technologies so we can overcome threats that are yet to come.

An amazing collection

In today's wartime environment, they continue to sustain and improve incredibly complex systems for the warfighter that are being used by operational forces in Afghanistan. It's an amazing collection of technologies, munitions and weapons that make it possible for Air Force warfighters to shape and dominate an unconventional conflict like the one we face against terrorism. As President Bush so aptly put it recently, "The brave men and women of our military are rewriting the rules of war with new technologies and old values like courage and honor."



or combat capability

Using courage and honor

Even though AFMC people are not necessarily on the front lines, their courage and honor are evident in the way they are giving America's warfighters greater capabilities.

At Hill AFB, Utah, Air Force Ammunition Reserve Team members have distributed nearly 4 million pounds of precision-guided bombs and saved \$1.5 billion by refurbishing and reconfiguring these munitions.

For the first time in combat, America's warfighters are dropping cluster bombs contained in wind corrected munitions dispensers against Taliban forces in Afghanistan with devastating effects.

People at Eglin AFB's Air Armament Center in Florida developed a guidance kit for cluster munitions in half the time expected at one quarter the cost. The weapons also exceeded all accuracy and performance requirements.

At Warner-Robins AFB, Ga., workers reduced the number of C-5 transports under repair by 26 percent, getting more

planes back to the airlifters who need them. They also increased the mission capable rate of the C-5, now more than 30 years old, by 15 percent.

New discoveries

The command's Air Force Research Laboratory, headquartered at Wright-Patterson AFB, Ohio supported the discovery of a new high-density nitrogen propellant increasing rocket and spacecraft propulsion.

Edwards AFB, Calif., home to the Air Force Flight Test Center, celebrated 50 years of a unique role forging aerospace power. Edwards is designated as a national aerospace historic site for its work in pioneering jet engine propulsion to breaking the sound barrier to piloting aircraft to the edges of outer space. Edwards people continue today to "push the envelope," as they test the Air Force's F-22 air dominance fighter, now in low-rate initial production.

Whether it's Air Force logistics centers rebuilding and repairing engines and modernizing aircraft capabilities, or test

centers developing a new generation of bunker-busting bombs, Air Force Materiel Command people are building a legacy for the future as rich in technology as the legacy we inherited from our predecessors — people like Orville and Wilbur Wright.

Legacy for the future

Many Americans may not realize that in only two years we'll celebrate 100 years of powered flight, recognizing the Wright Brothers first flight on Dec. 17, 1903.

From their Wright Flyer to the Global Hawk unmanned aerial vehicle and Joint Strike Fighter, these advances were made possible by people who are willing to roll up their sleeves and say "I'm going to get it done no matter what."

If you want to measure the dedication, patriotism and industrial might that AFMC people bring to this nation, simply turn on your TV and watch the news! We, as part of the Air Force team, have clearly shown that we can make a difference. God bless the United States of America.

Brooks adventurer a real-life 'action figure'

Even he admits that leaping tall buildings in a single bound would be a seemingly insurmountable challenge for him. But don't bet against 1st. Lt. Mike Wyman not attempting the impossible, for he exudes an "Indiana Jones-like" passion for high adventure.

Lt. Wyman fits the textbook definition of the cliché "don't judge a book by its cover." His mild-mannered demeanor and choirboy looks belies the fact that this 25-year-old Columbia, S.C. native is fiercely competitive and motivated by a perpetual adrenaline rush.

"Participating in extreme sports gets me in touch with my mortality. It makes me appreciate being alive," said Lt. Wyman, 311th Human Systems Program Office program manager for the F-22 life support integration and fixed aircrew seat programs at Brooks Air Force Base, Texas.

It all began here

He first cut his teeth on danger as a teenager living in Israel. Familiar with the high security culture of a nation where his father was the U.S. Embassy's military attache, he jumped at the chance to experience some freedom of movement.

"Their spring break is called 'a week without walls.' It was my first outdoor adventure," he recalls.

His "vacation" was not for anyone with coronary heart trouble. "We wandered the countryside in jeeps, accompanied by armed guards. We went horseback riding in the Golan Heights. The only problem was the minefields. We had to stick to the path," he said.

He was hooked

The trip concluded with rappelling down a 100-foot cliff, followed by whitewater rafting in the Jordan River. The Persian Gulf War prevented Lt. Wyman from participating in another similar trip. By then, he was hopelessly hooked on adventure of any kind.

Back in the states, he resumed his heart-stopping activities. He whitewater rafted West Virginia's New River with rapids so swift that swimming is banned. He progressed to more treacherous water as a Georgia Tech University outdoor recreation club member.

Learning to avoid danger

"They taught me how to avoid dangerous situations in whitewater rafting. My goal was to be a guide on these rafting trips," he said. He eventually became an uncertified guide. "I was like a fish out of water," he confessed.

Fifteen feet from shore, one of his rafters had fallen overboard. "I thought that it was going to be a long day." His prediction proved correct. Ahead of him near the first series of rapids, the trip leader was setting up a water rescue training exercise.

"I was supposed to eddy my raft into a stagnant section of water and wait until the leader finished setting up rope safety," he remembers.

He eddied out too much, forcing his boat to shoot the rapids. "The guy setting up rope safety screamed at me, 'I'm not ready!'"



First Lt. Mike Wyman, Brooks AFB, Texas, took his first tandem parachute jump shortly after arriving at Brooks. Lt. Wyman is in the red jump suit. (Courtesy photo)



First Lt. Mike Wyman, foreground in blue helmet, volunteered to be the lead paddler on this whitewater rafting trip in August 2001 in Colorado. Categorized as a class 5 river, because of its rapids confined by narrow rock walls, this waterway is second only in difficulty to class 6 rivers, considered unnavigable. (Courtesy photo)

I screamed back, 'Don't distract me!'" he said.

On another rafting trip, an underwater rock that he did not see in time caused his airborne ejection from the raft. "The raft kept going down river. They (crew) didn't know I was gone!"

While whitewater rafting is inherently dangerous, kayaking through rapids is potentially deadly.

"The challenge is staying upright. You're in a small canoe with your legs basically trapped straight in front of you," he said. "You're very low in the water, unlike rafting where the boat is high off the water," he said.

The worst trip

Lt. Wyman's claim to fame is having survived the worst kayaking trip in Georgia Tech history. Before the trip, he practiced in a pool the "Eskimo roll," a maneuver to upright a kayak

if they become submerged.

"Flipping your kayak upside down so your head is underwater is not a good position to be in. If you don't recover, you'll drown."

Already an apprehensive novice kayaker, his confidence waned when his kayaking partner executed an incorrect Eskimo roll on the river, dislocating his shoulder. "I was real shaky on the water. I had mimicked my partner's moves," he admits.

His nerves were made even more jittery when an angry shotgun-wielding property owner confronted the trespassing trip guide, who had escorted the injured kayaker on shore seeking medical help.

A date with destiny

Meanwhile, he was floating down river toward his "Titanic" date with destiny. He flipped over at the first sets of rapids.

"I was upside down," he said. "I had wedged the nose of my kayak under a rock." Trying to roll against the swift current was fruitless.

"I was beginning to panic," he said. "I had put my foot pegs too far forward. I was too tight in the boat. I couldn't escape."

That's where it ended

After his rescue, Lt. Wyman flipped his boat again. This time, he ejected out of the boat except for one wedged foot.

"I was heading toward rapids we weren't supposed to go to," he said. Lt. Wyman's kayaking career ended after his second rescue.

Since arriving at Brooks, Lt. Wyman has tried tandem parachute jumping.

"In tandem jumping, you're in a sitting position with your legs straight out, he said. "The instructor actually does the landing."

He loved having a temporary facelift molded by 150-mph winds, calling the experience "a blast."

As a certified deep-sea diver, Lt. Wyman has negotiated Malaysia's underwater caves, fought off two aggressive remora fish along Florida's coast and survived shark-infested waters off Australia's Great Barrier Reef.

"I'll try anything once," he said, hoping someday to ride a bull.

He came close to a bull moose riding him. He missed hitting the beast on a Colorado mountain road, following his survival in August of one of the toughest whitewater rafting trips in America.

— Mr. Rudy Purificato, 311th HSW

Software designer's inventions improve quality of life for others

A Standard Systems Group section chief's knack for tinkering with hardware has changed two lives at Maxwell Air Force Base, Gunter Annex, Ala.

Mr. Hadley Bean, SSG's Software Factory Windows-DOS section chief is an inventor of sorts. His most recent creation is what he calls a "fitness treadmill" which allows wheelchair-bound people to exercise, much the same as a walking treadmill does for others.

"The precision and durability of this machine is simply amazing," said Mr. Rick Hinder, a software program manager who the treadmill was designed for. "When I brought two rollers in and showed them to Mr. Hadley, I never would have even imagined he would design something like this."

The all-metal stand, which only weighs 100 pounds, consists of three elements: brakes, tension and height. This allows Mr. Hinder to employ an exercise program without any assistance, something he's not been able to do in the past. "It's a full exercise unit, allowing me to exercise my upper body, back, stomach and cardiovascular system — it's like riding around a track in a stationary mode," he said.

Mr. Hinder broke his neck in a car accident when he was 16 years old. Because he lives alone, he said being able to function without assistance means a lot to him. "This gift has given me a sense of independence that I didn't have before," he said.

People who've seen the apparatus that Mr. Bean designed tried to get him to consider putting a patent on it or sell it for mass production. "There's nothing that even comes close to this that exists on the market," Mr. Hinder said. "It's easy to use, lightweight and durable."

Mr. Bean, however, says the design is a one-time good deal. "I only did this because it enabled me to make someone's quality of life be a little better."

According to Mr. Bean, the project couldn't have been done without the community's help. "The cost to make this was minimal because people were so willing to help," he said. After he created the design in PowerPoint, Mr. Robin Roberts, a local machinist, transformed it into a computer file that drives an automated metal cutter; J&P Machine shop cut the metal; Mr. Ernest Folks, P&A Auto Body Shop, donated an emergency hand brake; and Mr. Carl Cain, Carl's Hardware, donated the hardware.

"This was definitely a community effort that epitomizes the relationship that exists between the base and community here in Montgomery," Mr. Bean said.

And the treadmill isn't Mr. Bean's first creation. He also created and built a keyboard elevator that allows another SSG member to do her job comfortably.

Due to a back injury, Ms. Sandi McBride, former Software Factory specialist teams chief, is required to stand 10 minutes of every 30. Mr. Bean said he formed the keyboard elevator creation when he noticed Ms. McBride trying to stand and type with her keyboard on top of the monitor.

He designed and built the keyboard elevator within two weeks.

"These creative engineering efforts are just two examples of many Mr. Hadley's done here on his own time and expense during the past 30 years," said Mr. Ken Heitkamp, SSG's technical director and Software Factory director. "His actions clearly demonstrate the unique initiatives we do to improve the work environment for military and civil service personnel with the Standard Systems Group."

— Tech Sgt. Darlene Foote, SSG Public Affairs



Mr. Rick Hinder demonstrates a "fitness treadmill" designed for him by Mr. Hadley Bean, an inventor of sorts at Standard Systems Group.

Student builds memorial to terrorism victims

Not wanting Americans to take their freedom for granted, Mr. Drew Spivey, a second-year construction student at Metro Tech's Skill Tech Campus in Oklahoma City, designed and built a memorial to honor Americans who died in terrorist attacks on American soil.

Tinker Air Force Base, Okla., is currently working with Metro Tech and other technology centers to ensure well-trained candidates for future job opportunities at the base.

"I even caught myself forgetting how free we are compared to other countries," Mr. Spivey said.

The Memorial for Fallen Americans was recently dedicated on the Skill Tech Campus. A concrete memorial plaza resembles the Pentagon surrounding the World Trade Center towers and the Alfred P. Murrah Federal Building.

Atop the Pentagon structure are three flagpoles displaying the American flag and state flags for Oklahoma and New York.

A plaque is attached to each structure, with the name of the structure and date of the terrorist attack. The Pentagon plaque features an eagle with the words: "An attack on one American is an attack on all Americans."

The plaques on the World Trade Center identify each tower as north or south, and show children holding hands and includes the words: "Lost to foreign terrorism" and "Together we stand."

The plaque on the Murrah Building features the American flag and the words: "Lost to domestic terrorism" and "We shall never forget our fallen Oklahomans."

"We started building a sidewalk and I figured if they'd let us build a sidewalk, why not build something that meant something

rather than just something to walk on?" Mr. Spivey explained.

Two students, Mr. Josh Rodgers and Mr. Paul Schrader, helped him build the plaza, which took four to six weeks to complete. The World Trade towers are 10 feet high, the Murrah building is two-and-a-half feet high and the Pentagon is 28 inches high.

Mr. Spivey said he encountered no problems in receiving Metro Tech's permission or a permit for the project. Skill Tech's campus administrator, Mr. Steve Prieto, granted Mr. Spivey permission. Mr. Jim Clark, Mr. Spivey's instructor, said his student began designing all three structures because he wanted to incorporate the three together.

"The biggest thing he learned was to draw and lay out a pentagon, which probably not many people can do because it's quite an involved procedure," Mr. Clark said.

"We went through a study lesson on drawing a pentagon and then went out and built it. It turned out to be a wonderful project," he continued.

Dr. James Branscum, Metro Tech superintendent, said the memorial is important in "keeping the freedom alive."

Two former World War II veterans who helped keep freedom alive attended the ceremony and were presented with high school diplomas. They did not receive their diplomas when called to duty. Dr. Merlene White, assistant principal and dean of instruction at Douglass High School, presented the diplomas to Mr. Joe Murdock and Mr. Willie McNeal, both Douglass graduates.

— Mr. Ray Dozier, OC-ALC Public Affairs





Firefighters from Tinker AFB, Okla., go through rubble following the 1995 Alfred P. Murrah federal building bombing in Oklahoma City.

Tinker firefighter shares his experience with New York City Ground Zero workers

A thoughtful act can create camaraderie among workers from near and far.

That's just what happened when Capt. Norman Yeingst, of the Tinker Air Force Base, Okla., Fire Department, took a signed firefighter's helmet to firefighters in New York City.

Capt. Yeingst recently traveled to Washington, D.C., to teach an alternative fuels class for the Department of Transportation. "It was for fire departments that respond to alternative fuel bases like we have here," he said.

Making a decision

He decided he would go to New York City after teaching the class to visit firefighters there.

"I made some contacts with some people I've had in some classes before," he said. "One of them was a deputy chief for the NYPD and I told him I'd like to come up there. He said it would be no problem."

When Capt. Yeingst's fellow firefighters discovered he was going on the visit, they requested he take one of the department's helmets with him.

"I took one of the helmets signed by a majority of the firefighters here," he said. "I also took one of the ribbons we got for responding to the Oklahoma City bombing. When I got up there, they picked me up in a squad car and made arrangements for a place for me to stay."

Capt. Yeingst said he went to the rubble that used to be the World Trade Center and took pictures while he carried the hel-

Oklahoma City and from people who had responded to the Oklahoma City bombing."

Capt. Yeingst received a memorial T-shirt from the New York City station. He plans to have it framed and hung in the Tinker fire station.

We understood

He said the New York City firefighters were more touched by his gift than any other, "because of the fact that it's from Oklahoma City, from somebody who had been through something similar to what they were going through."

Capt. Yeingst said all personnel in the emergency service field have been

deeply affected by the Sept. 11 attacks on the World Trade Center and the Pentagon.

In addition to more than 2,900 lives lost in the terrorist attacks, 343 New York City firefighters lost their lives in the rescue mission.

"They're having some of the same problems we had here," he said. "It was something to do for the guys to let them know we know how they feel."

— Mr. Ray Dozier, OC/ALC Public Affairs

New York City firefighters were touched by the gift from Tinker because it was from Oklahoma City, which had been through something similar.

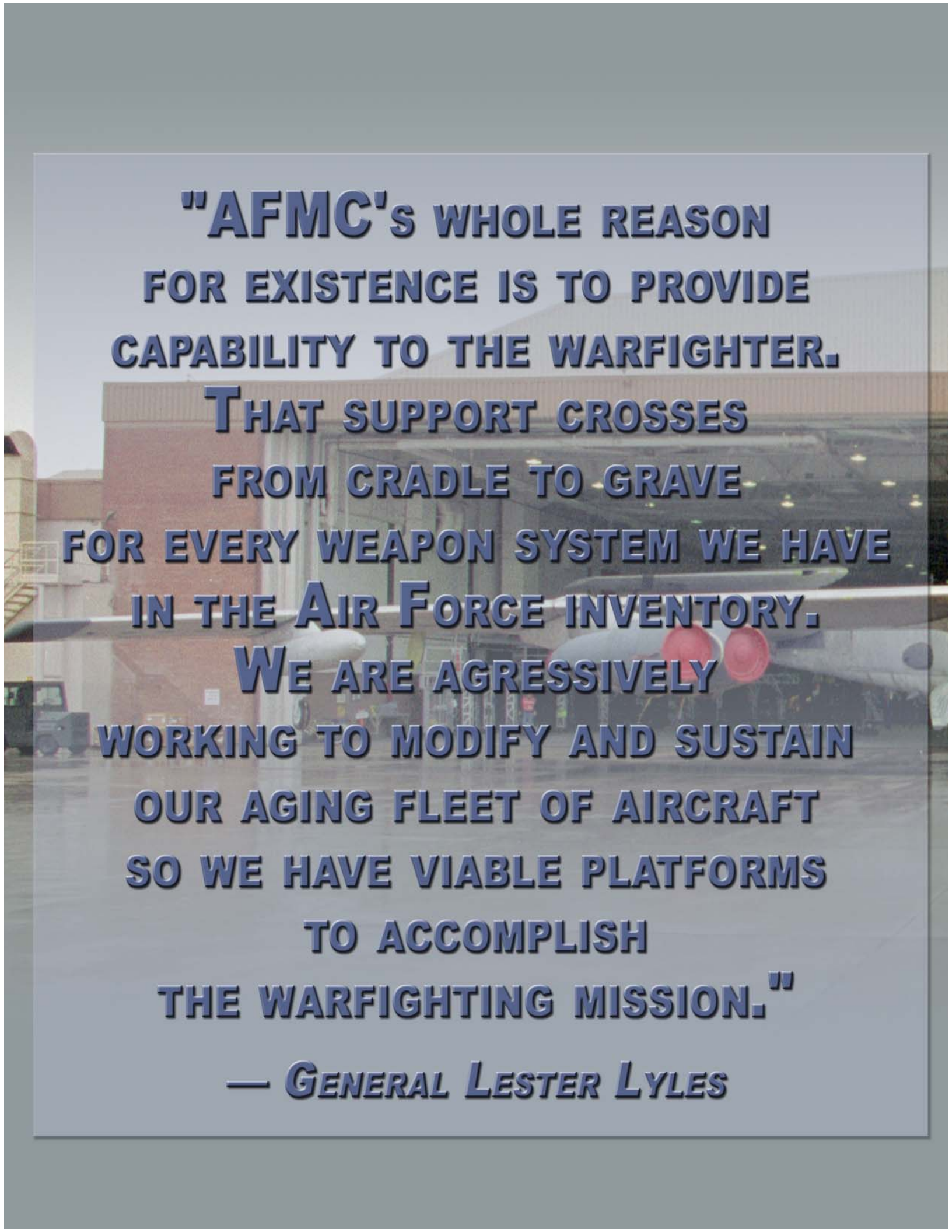
Capt. Norman Yeingst, OC-ALC firefighter

met with him. After visiting with some firefighters at the site, he went to Engine Company 4 Manhattan/Ladder Company 15, Manhattan station.

A heartfelt gift

"I gave them the helmet and told them what it was for," he said. "I said, 'You guys have been through something we've been through and the guys wanted me to bring this to you.'"

"The station's lieutenant called everybody up there to the station. They were really happy to get it; they were wound up from the fact that it was from



**"AFMC's WHOLE REASON
FOR EXISTENCE IS TO PROVIDE
CAPABILITY TO THE WARFIGHTER.
THAT SUPPORT CROSSES
FROM CRADLE TO GRAVE
FOR EVERY WEAPON SYSTEM WE HAVE
IN THE AIR FORCE INVENTORY.
WE ARE AGGRESSIVELY
WORKING TO MODIFY AND SUSTAIN
OUR AGING FLEET OF AIRCRAFT
SO WE HAVE VIABLE PLATFORMS
TO ACCOMPLISH
THE WARFIGHTING MISSION."**

— GENERAL LESTER LYLES